COMPARATIVE TEST OF A CHLORIDE OF SILVER DRY CELL AND AN ACID CELL.

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ALTHOUGH every one who has ever used an acid battery is well aware of the fact that it is not a constant source of electricity, and, moreover, that even when an open circuit, its electro-motive force is subject to a continual and sometimes rapid diminution; still I have thought it might be interesting to make a comparative test between an ordinary acid battery and a chloride of silver cell, and exhibit the results in such a way that their great differences in this repect could be seen at a glance.

With this object in view, an acid battery of five cells was joined in circuit with a resistance box and an ammeter, a voltmeter being also in metallic connection with the terminals of the battery. The battery was of the ordinary zinc-carbon-chromic-acid form, the size of the zinc plate being about 3 x 1⅜ inches, and the chromic acid solution being made up, of water—5 pints; sulphuric acid—7 fluid ounces; chromate of potash—8 ounces.

The voltmeter was not continually in circuit. Only when a reading of the electro-motive force was taken was this the case, the circuit being made by means of a push button with which the voltmeter was provided. Both the voltmeter and mil-ammeter were of the Weston type and had, only a few days previously, been received from the manufacturer's laboratory.

Fig. 1 shows the manner in which the various pieces of apparatus were connected. *B* is the battery of five cells; *R* is the resistance box or rheostat; *M A*, the mil-ammeter (always in circuit); *V M*, the voltmeter, and *w w*, etc., are the wires or conductors completing the circuit. The voltmeter and ammeter were placed at a distance apart sufficient to insure complete absence of any disturbing effect of one on the other—a precaution, which, however, for ordinary purposes, is unnecessary, as the Weston instruments are practically unaffected by surrounding magnetic conditions.

Frequent observations of the current, as well as the e. m. f. were made during the day, the values tabulated, and from these, curves were plotted, which are shown in Fig. 2.

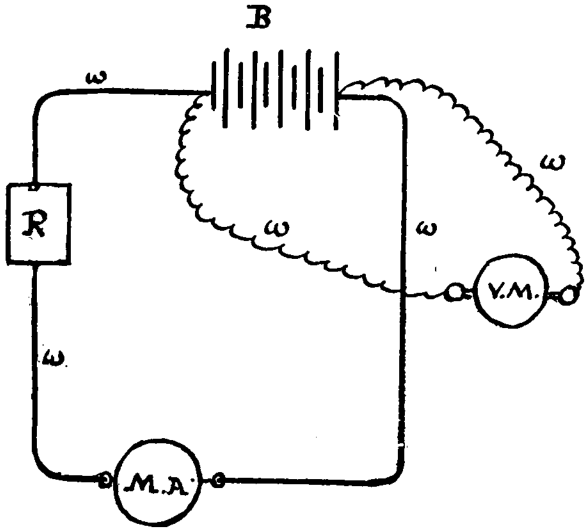

Fig. 1.

Curve *A B C* was constructed from the values of current furnished by the chloride of silver cell, curve *D E F* having been similarly constructed for the acid cell. As

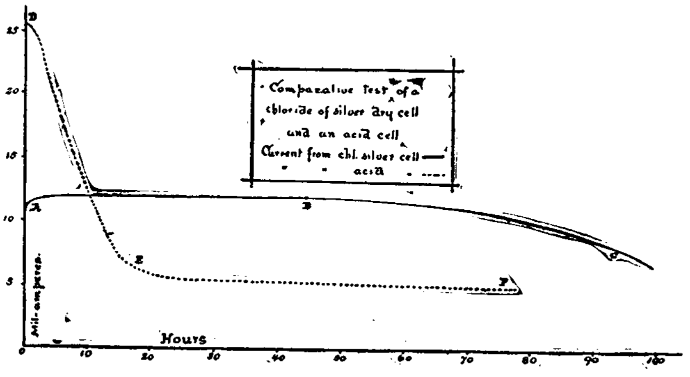

Fig. 2.

the size of the zinc plate in the latter was at least five or six times as great as that of the chloride silver cell, the resistance in circuit was adjusted so as to make the current from the acid battery about 2½ times as great as that from the chloride silver battery. The resistances, however, in both cases was not changed during the test, but remained always the same as at the outset.

A glance at the curve shows how very different the batteries behaved. Starting at nearly 26 m. a., the current from the acid battery began at once to diminish, and after ten hours had fallen below that of the silver chloride cells. After twenty hours of service it had diminished to between five and six mil-ampères, which value was subject to but little subsequent change.

During this time the electro-motive force fell from 1.80 volts per cell to 0.32 volts. After twenty hours' service the e. m. f. was 0.37 volt, so that, practically the battery was then useless.

After being in circuit about eighty hours, the battery was disconnected and allowed to recuperate. The recovery was insignificant, amounting to only about 0.12 volt per cell.

The curve, *A B C*, shows that the current from the silver chloride cell, starting at about 10.2 m. a., gradually increased until it reached the value 12.0 m. a., after which it remained practically constant until the cells had been in operation for about seventy-five hours. This rise in the current, as well as in the e. m. f. (which for these cells is almost exactly one volt), is due to the gradually diminished internal resistance of the cells, consequent upon the conversion of chloride of silver—a comparatively poor conductor—into metallic silver, a very perfect conductor. The change is, however, small, and could be avoided by short-circuiting the cells for a few minutes—a proceeding which is not advisable. The theoretical capacity of these cells, calculated from the weight of the chloride of silver contained in them, is about 1000 mil-ampère hours, and the curve shows how nearly the actual life corresponds with that given by theory.